Students’ Perceptions of Research-Based Problem Solving Strategies in Physics
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Research Questions

• What are students’ perceptions of research-based strategies implemented in algebra-based physics?

• How do these strategies compare with traditional strategies already used by the students?

Research-Based Strategies:
Questioning & Structure Mapping

Questioning:
• Generate questions for subjects to ask themselves based on knowledge needed to answer problem.
• What does X mean?
• What does X look like?
• What causes X?

Structure Mapping:
• Provide a visual representation which expresses functional relations between concepts and quantities.

Participants

‘Descriptive Physics’
– Algebra-based introductory physics

• About 80% Architecture majors
• Spring 2007
• N=150

Research Design

Quantitative Study Result
No significant difference in homework or exam scores between treatment and control groups

Qualitative Semi-Structured Interviews

• Interview 1
  • Described how they work through a problem
  • (Re) Introduced to treatment strategy
  • Worked through pair of contrasting problems using either questioning or structure mapping
  • Applied strategy to problem from Interview 1
  • Asked about perceptions of the strategy applied.
Qualitative Results
Perceptions of Questioning Strategy
• Purpose of strategy:
  • Helps in visualizing and focusing (4 of 4 students)
    “…to help us visualize the problem, to … think of what
    we should take into account, … of what shouldn’t be
    taken into account…”
  • Comparison with own strategy:
    • Mimics question asking, similar to own (4 of 4)

Qualitative Results
Perceptions of Structure Mapping
• Purpose of strategy:
  • Map presented problem information (3 of 4 students)
  • Map made relationships apparent (4 of 4)
    “… when you figure out … what it gives you and then
    how to figure out what equation to use from the
    arrows, helps, … it tells you what you need in order
    to figure out how to get the answer.”
  • Comparison with own strategy:
    • Not comparable (4 of 4)

Conclusions
• Neither questioning nor structure mapping appears to
  be effective as measured by homework and exam
  performance -- perhaps longer study needed.
• Students report that both strategies are user friendly
  – but more structure mapping students completed
  interview problem vs. fewer questioning students.
• Problems with strategies:
  • Questioning strategy: Tendency to answer questions using
    equations.
  • Structure mapping strategy: Inability to see value of paired
    problems.

Current Work
• One Strategy at a Time
  • Cleaner focus for research project
  • Start with structure mapping

• Long Term Study
  • Learn how problem solving skills develop over the long term.

Currently adapting and implementing structure mapping
in algebra based General Physics.
Thank You!
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